

# BEACLS: Berkeley Efficient API in C++ for Level Set methods Installation Guide

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2017/04/11

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# System requirements

- Required
  - OS
    - Mac OS X Sierra
    - Ubuntu Linux 16.04 LTS (x86\_64)
    - Windows 7/8.1/10 (64bit)
  - Hardware
    - CPU: Intel Core Processor CPU
- Recommended
  - Hardware
    - CPU: 4<sup>th</sup> Generation Intel Core Processor CPU (Haswell arch.) or later
    - GPU: NVIDIA GeForce 900 Series GPU (Maxwell arch) or later
  - OS
    - Windows 10 Creators Update (version 1703, Redstone 2)
      - Required for Bash on Ubuntu on Windows

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# Install to Mac OS X Sierra

1. Install Homebrew  
\$ export PATH=/usr/local:\$PATH  
\$ sudo mkdir -p /usr/local  
\$ ruby -e "\$(curl -fsSL https://raw.githubusercontent.com/Homebrew/install/master/install)"
2. Install OpenMP, boost, OpenCV and hdf5  
\$ brew update; brew upgrade  
\$ brew install llvm boost hdf5  
\$ brew install -with-ffmpeg -with-tbb opencv3  
\$ brew link opencv3 --force
3. Download BEACLS  
\$ mkdir ~/BEACLS; cd ~/BEACLS  
\$ git clone <https://github.com/HJReachability/beacsls>  
\$ cd beacsls
4. Build BEACLS  
\$ cd beacsls/sources  
\$ make all
5. Test BEACLS  
\$ cd samples/Plane\_test  
\$ make test

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# Install to Ubuntu Linux 16.04 LTS (Without GPU)

These instructions only work for Ubuntu 16.04, not 18.04!

## 1. Install boost, OpenCV and hdf5

For Ubuntu 14.04, use branch 14.04.

```
$ sudo apt update
```

```
$ sudo apt upgrade
```

```
$ sudo apt install libhdf5-dev libboost-dev libopencv-dev
```

## 2. Download BEACLS

```
$ mkdir ~/BEACLS; cd ~/BEACLS
```

```
$ git clone https://github.com/HJReachability/beacsls
```

```
$ cd beacsls
```

## 3. Build BEACLS

```
$ cd beacsls/sources
```

```
$ make all
```

## 4. Test BEACLS

```
$ cd samples/Plane_test
```

```
$ make test
```



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# Install to Ubuntu Linux 16.04 LTS (With GPU)

1. Install zlib, boost, OpenCV and hdf5

```
$ sudo apt-get update
$ sudo apt-get upgrade
$ sudo apt-get install zlib libhdf5-dev libboost-dev libopencv-dev
```
2. Download and install CUDA 8.0  
<https://developer.nvidia.com/cuda-downloads>
3. Download BEACLs

```
$ mkdir ~/BEACLs; cd ~/BEACLs
$ git clone https://github.com/HJReachability/beacl
$ cd beacl
```
4. Build BEACLs

```
$ cd beacl/sources
$ make WITH_GPU=Y NVCC=/usr/local/cuda-8.0/bin/nvcc all
```
5. Test BEACLs

```
$ cd samples/Plane_test
$ make test
```

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# Install to Windows 7/8.1/10 (Without GPU)

## 1. Download and install HDF5 Pre-built Binary Distributions

### 1. Download binary distribution from HDF group site

- <https://www.hdfgroup.org/HDF5/release/obtain5.html>
- 1.8.18-win64-vs2015: <http://www.hdfgroup.org/ftp/HDF5/current/bin/windows/extra/hdf5-1.8.18-win64-vs2015-shared.zip>

### 2. Extract a zip file and install it.

## 2. Download and install Boost

### 1. Download binary distribution from the site: <http://www.boost.org/users/download/>

- 1.63.0: [https://sourceforge.net/projects/boost/files/boost/1.63.0/boost\\_1\\_63\\_0.zip/download](https://sourceforge.net/projects/boost/files/boost/1.63.0/boost_1_63_0.zip/download)

### 2. Extract a zip file to c:\Boost\Boost\_1\_63\_0

## 3. Download and install OpenCV

### 1. Download binary distribution from the site: <http://opencv.org/>

- 3.2.0: <https://sourceforge.net/projects/opencvlibrary/files/opencv-win/3.2.0/opencv-3.2.0-vc14.exe/download>

### 2. Execute installer and extract files to c:\OpenCV3\opencv3.2.0

# Install to Windows 7/8.1/10 (Without GPU) (cont'd.)

## 4. Download and install git for Windows

1. Download binary distribution from the site : <https://git-for-windows.github.io/>
  - 2.12.0-64bit: <https://github.com/git-for-windows/git/releases/download/v2.12.0.windows.1/Git-2.12.0-64-bit.exe>

2. Execute installer

## 5. Download and install tortoisegit

1. Download Boost from Boost site: <https://tortoisegit.org/>
  - 2.4.0.2-64bit: <https://download.tortoisegit.org/tgit/2.4.0.0/TortoiseGit-2.4.0.2-64bit.msi>

2. Execute installer

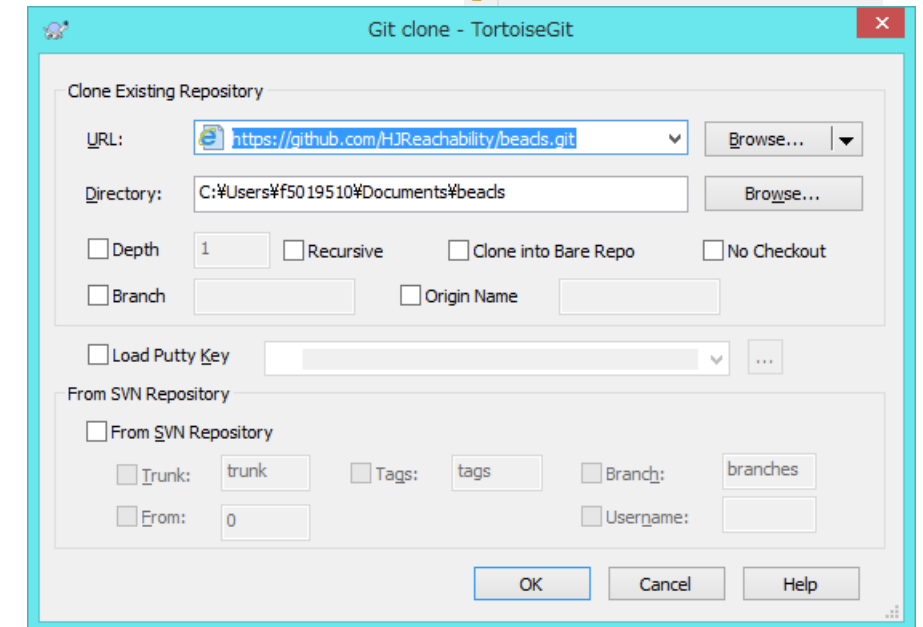
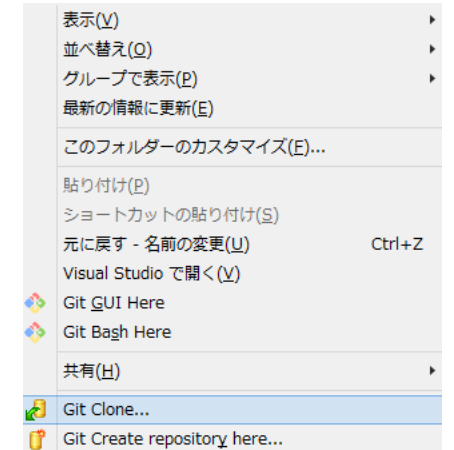
## 6. Download and install Visual Studio 2015

<https://www.visualstudio.com/vs/older-downloads/>

# Install to Windows 7/8.1/10 (Without GPU) (cont'd.)

## 7. Download BEACLS

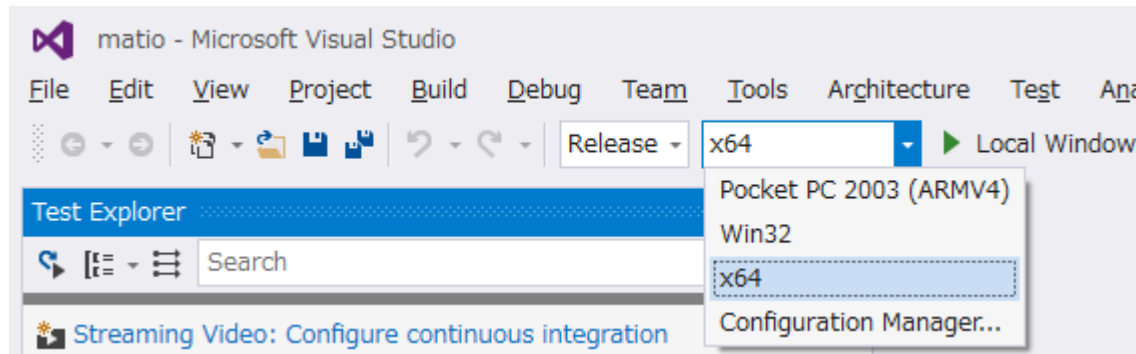
1. Open Documents folder by explorer
2. Choose “Git clone...” from cotext memu.
3. Set repository information and push OK  
URL: <https://github.com/HJReachability/beacsls>
4. Open beacsls folder



# Install to Windows 7/8.1/10 (Without GPU) (cont'd.)

## 8. Build matio (Matlab file I/O library)

1. Run Visual Studio solution from the batch file
  - sources\run\_visualstudio14\_matio.bat
    - It sets environmental variables for some libraries paths.
2. Choose “Release” as Solution Configuration and “x64” as Solution Platform

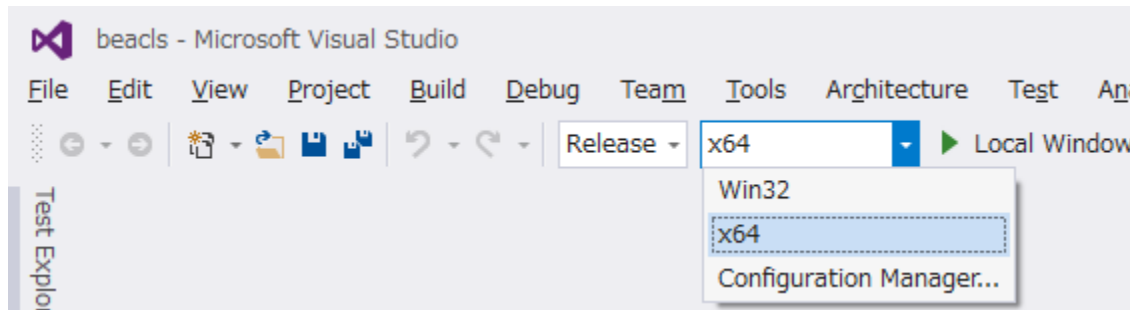


3. Build matio by pushing “F7” key.

# Install to Windows 7/8.1/10 (Without GPU) (cont'd.)

## 9. Build BEACLS

1. Run Visual Studio solution from the batch file
  - sources\run\_visualstudio14\_beacsl.bat
    - It sets environmental variables for some libraries paths.
2. Choose “Release” as Solution Configuration and “x64” as Solution Platform



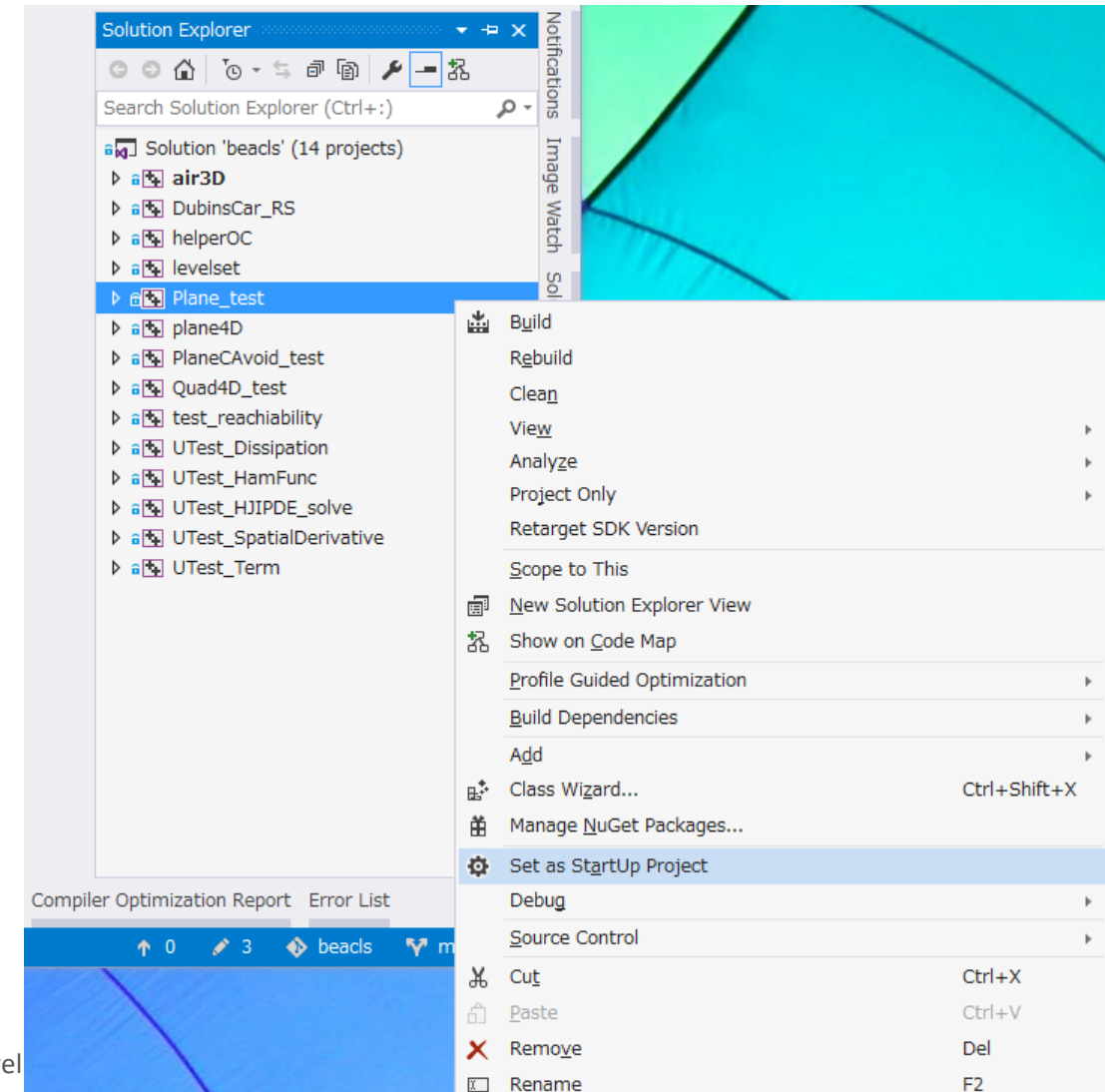
3. Build all projects of beacsl solution by pushing “F7” key.



# Install to Windows 7/8.1/10 (Without GPU) (cont'd.)

## 10. Execute Plane\_test

1. Click “Set as StartUp Project” from a context menu of Plane\_test in Solution Explorer
2. Execute Plane\_test by pushing “F5” key.



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# Install to Windows 7/8.1/10 (With GPU)

Install from step 1 to step 8 of Windows 7/8.1/10 (without GPU)

9. Download and install CUDA 8.0

<https://developer.nvidia.com/cuda-downloads>

# Install to Windows 7/8.1/10 (With GPU) (cont'd.)

## 10. Build BEACLs

1. Run Visual Studio solution from the batch file
  - `sources\run_visualstudio14_beacsl_cuda.bat`
    - It sets environmental variables for some libraries paths.
2. Run Visual Studio solution from the batch file

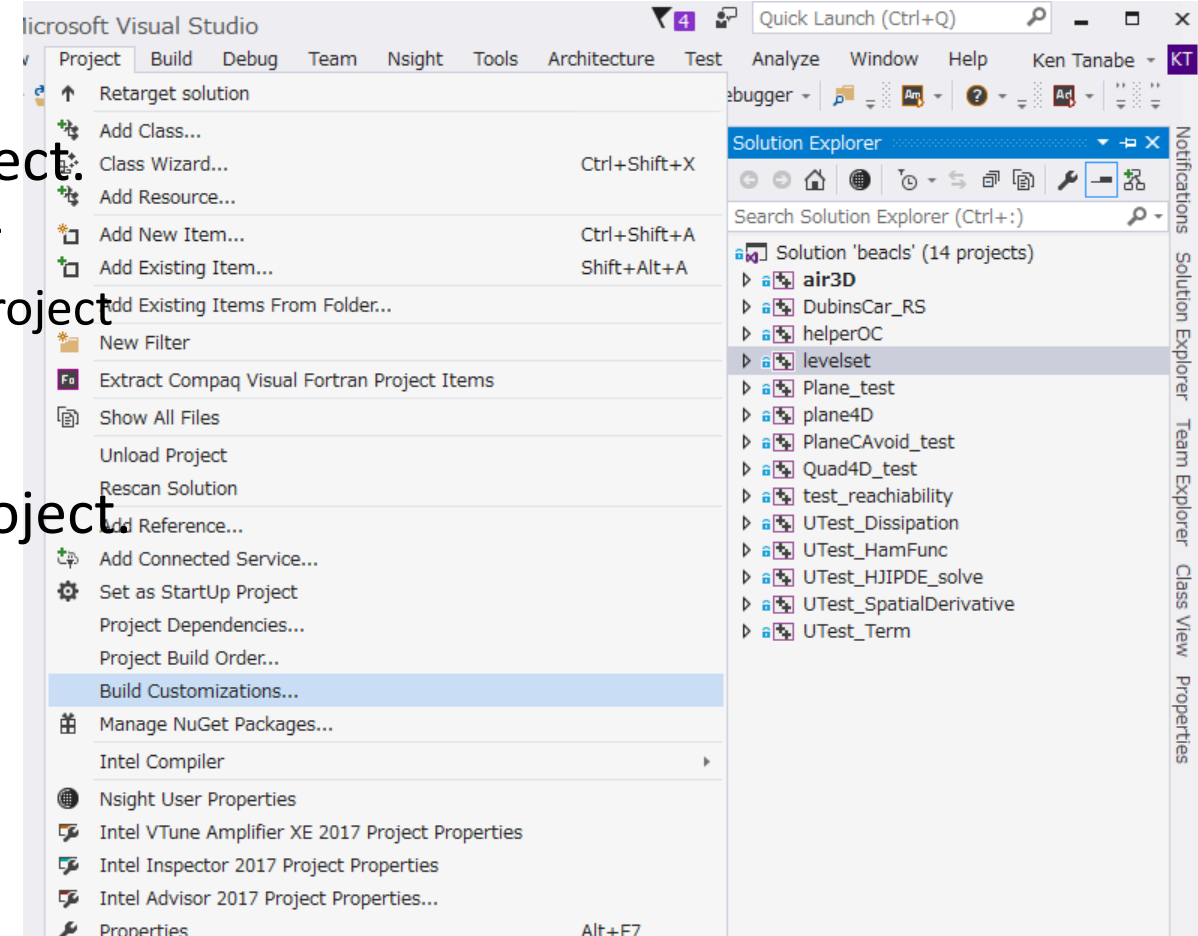
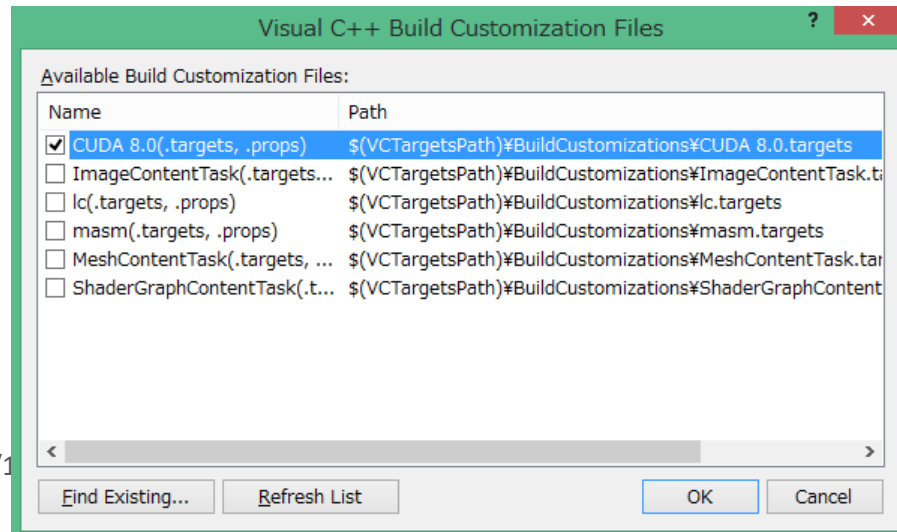
# Install to Windows 7/8.1/10 (With GPU) (cont'd.)

## 10. Build BEACLS (Cont'd)

### 3. Enable CUDA build for levelset project.

1. Choose “levelset” in Solution Explorer
2. click “Build Customizations...” from Project tab of tool bar.
3. Enable “CUDA 8.0(.targets, .props)”

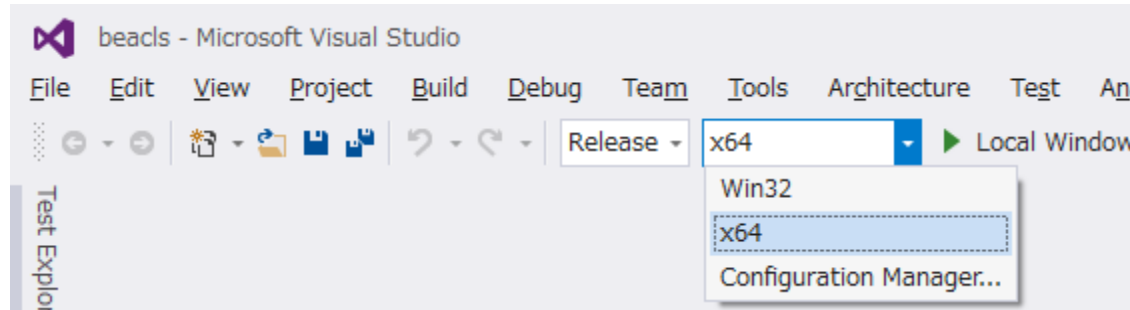
### 4. Enable CUDA build for helperOC project



# Install to Windows 7/8.1/10 (With GPU) (cont'd.)

## 10. Build BEACLs

5. Choose “Release” as Solution Configuration and “x64” as Solution Platform

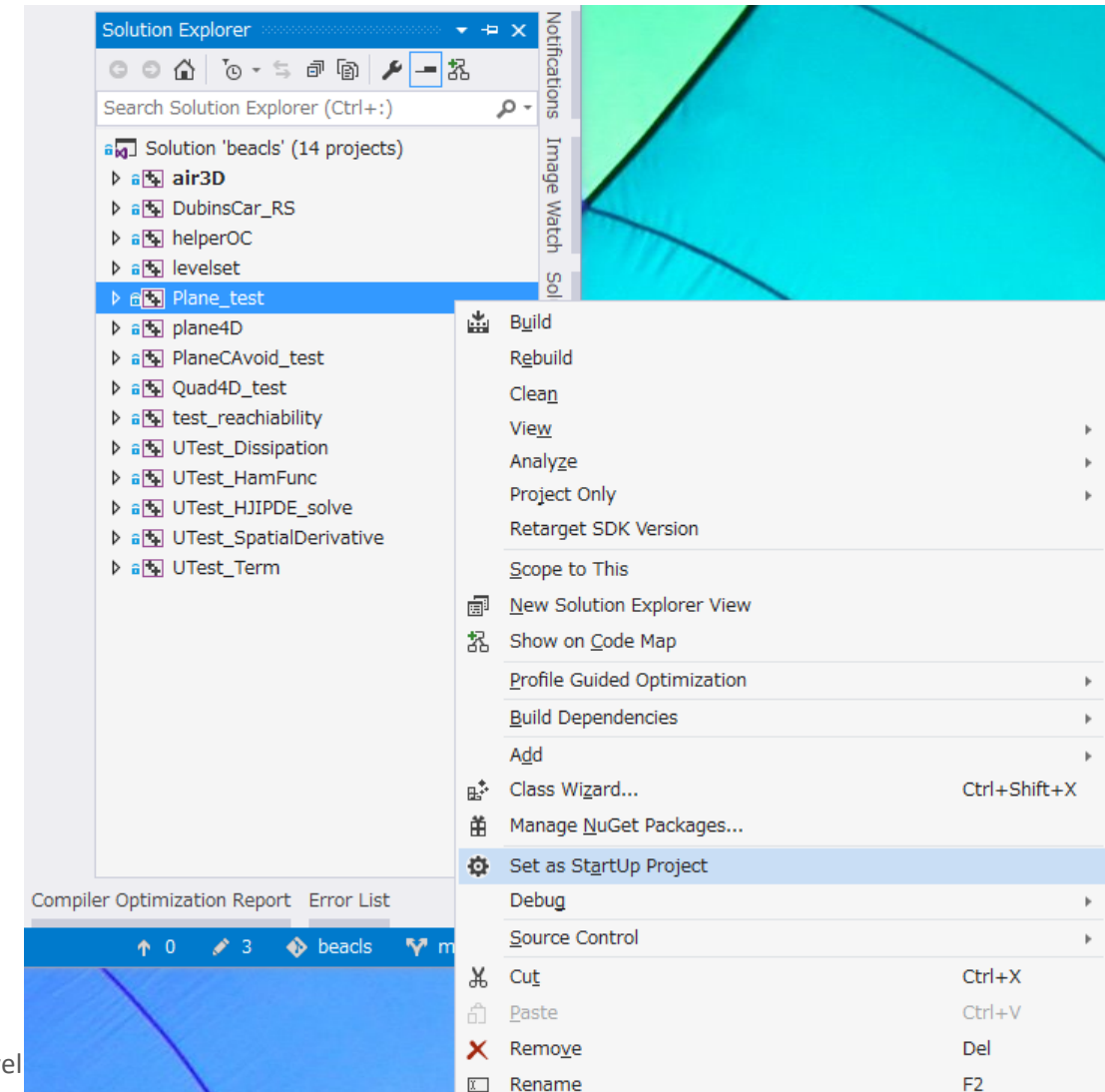


6. Build all projects of beacsls solution by pushing “F7” key.

# Install to Windows 7/8.1/10 (With GPU) (cont'd.)

## 11. Execute Plane\_test

1. Click “Set as StartUp Project” from a context menu of Plane\_test in Solution Explorer
2. Execute Plane\_test by pushing “F5” key.



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# Install to Bash on Ubuntu on Windows (Without GPU)

1. Update Windows 10 to Windows 10 Creators Update (version 1703, Redstone 2)
2. Install X Window System Server for Windows  
Cf) Xming : <http://www.straightrunning.com/XmingNotes/>
3. Run X Windows System Server
4. Install Bash on Ubuntu on Windows  
[https://msdn.microsoft.com/en-us/commandline/wsl/install\\_guide](https://msdn.microsoft.com/en-us/commandline/wsl/install_guide)
5. Run bash
6. Set DISPLAY environment variable  
\$ export DISPLAY=0:0

# Install to Bash on Ubuntu on Windows (Without GPU) (cont'd)

## 7. Install boost, OpenCV and hdf5

```
$ sudo apt-get update
```

```
$ sudo apt-get upgrade
```

```
$ sudo apt-get install libhdf5-dev libboost-dev libopencv-dev
```

## 8. Download BEACLS

```
$ mkdir ~/BEACLS; cd ~/BEACLS
```

```
$ git clone https://github.com/HJReachability/beacsl
```

```
$ cd beacsl
```

## 9. Build BEACLS

```
$ cd beacsl/sources
```

```
$ make all
```

## 10. Test BEACLS

```
$ cd samples/Plane_test
```

```
$ make test
```

# Thank you!